UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Application Number: 09/750,150
Filing Date: December 29, 2000
Appellant(s): JOURDAN ET AL.

Sumit Bhattacharya, Reg. No. 51,469
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed September 1, 2005 appealing from the Office

action mailed November 26, 2004.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

No amendment after final has been filed.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

No evidence is relied upon by the examiner in the rejection of the claims under appeal.

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102

1.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102

that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
> (b) the invention was patented or described in a printed publication in this or a foreign country or in
> public use or on sale in this country, more than one year prior to the date of application for patent in
> the United States.

2.   Claims 1-26 are rejected under 35 U.S.C. 102(b) as being clearly anticipated

by Wang et al., Highly Accurate Data Value Prediction using Hybrid Predictors

(Herein after "Wang et al.").

3.   The rejections for claims 1-26 set forth in the original office action mailed on

February 11, 2004, and maintained in the final rejection mailed on November 26, 2004,

are herein maintained. A copy of the maintained rejection appears below for the

convenience of the Board of Patents Appeals and Interferences.

4.   Referring to claim 1, Wang et al. have taught a method for predicting values in

a processor having a plurality of prediction modes, comprising:

    a. receiving an instruction at a first table (Page 288, Figure 6, A hashed

    instruction address is received at the VHT.);

    b. generating a valid signal from said first table (Page 288, Figure 6,

    "Prediction valid");

    c. providing a prediction mode for said instruction (Page 288, Figure 6, The

    "state" field and the 2: 1 MUX provide a prediction mode for said instruction.);

    d. determining a hit in a second table (Page 288, Figure 6, A hit in the PHT is

    determined and output.), said second table to provide a prediction value

(Page 288, Figure 6, The PHT provides a prediction value as the output of

the PHT.), said hit in the second table according to a function of said

instruction and said first table (Page 288, Figure 6, The instruction produces a

final prediction, labeled "predicted data value" of figure 6, from either the VHT

or the PHT. When the VHT does not make a prediction then the prediction for

the instruction comes from the PHT. The VHT provides values to index into

the PHT. The hit, or prediction, from the second table, or PHT, is necessarily

a function of the instruction and the first table as the values to index into the

second table are provided from a value from first table indexed by a hashed

instruction address.); and

e. predicting a predicted value according to said hit and said prediction mode

(Page 288, section 5.2, Figure 6, The 2: 1 MUX predicts a predicted value

according to the Hit and the "state" field.).

5.   Referring to claim 2, Wang et al. have taught the method of claim 1, as

described above, and wherein said predicting includes selecting said predicted value

from said first table (Page 288, section 5.2, Figure 6, If the 2-level predictor does not

make a prediction, then the predicted value is selected from the first table.).

6.   Referring to claim 3, Wang et al. have taught the method of claim 1, as

described above, and wherein said predicting includes selecting said predicted value

from said second table (Page 288, section 5.2, Figure 6, If the 2-level predictor

makes a prediction, then the predicted value is selected from the second table.).

7.   Referring to claim 4, Wang et al. have taught the method of claim 1, as

described above, and wherein said predicting includes selecting said predicted value

from said first table or said second table according to said hit in said second table

(Page 288, section 5.2, Figure 6, When the second table determines a hit the

predicted value is selected from the second table. When there is no hit in the second

table, then the predicted value is selected for the first table.).

8.   Referring to claim 5, Wang et al. have taught the method of claim 1, as

described above, and wherein said generating includes matching a first table tag

with said instruction (Page 288, section 5.2, Figure 6, The "Tag" field is matched

with said instruction.).

9.   Referring to claim 6, Wang et al. have taught the method of claim 5, as

described above, and wherein said generating further includes accessing an

information field in said first table correlating to said first table tag (Page 288, section

5.2, Figure 6, page 285, last paragraph, The Value History Pattern value is

accessed from the first table.).

10.   Referring to claim 7, Wang et al. have taught the method of claim 1, as

described above, and further comprising placing said prediction mode in a shift

mode (Abstract, Page 288, section 5.2, Figure 6, When the 2-level-predictor makes

a prediction, then the prediction mode is in a pattern mode, or shift mode.)

11.   Referring to claim 8, Wang et al. have taught the method of claim 1, as

described above, and further comprising placing said prediction mode in a count

mode (Abstract, Page 288, section 5.2, Figure 6, When the 2-level predictor makes a prediction, then the prediction mode is in a pattern mode, or count mode.).

12.   Referring to claim 9, Wang et al. have taught the method of claim 1, as described above, and further comprising placing said prediction mode in a stride mode (Abstract, Page 288, section 5.2, Figure 6, When the 2-level predictor does not make a prediction, then the prediction mode is in a stride mode.).

13.   Referring to claim 10, Wang et al. have taught the method of claim 1, as described above, and wherein said providing includes providing said prediction mode from said first table (Page 288, section 5.2, Figure 6, If the 2-level predictor does not make a prediction, then the predicted value is provided from the first table.).

14.   Referring to claim 11, Wang et al. have taught the method of claim 1, as described above, and further comprising transitioning to said prediction mode from a previous prediction mode (Page 288, section 5.2, Figure 6, Page 284 and 285, section 3.2, The prediction mode transitions from Init, Transit, and Steady state modes.).

15.   Referring to claim 12, Wang et al. have taught the method of claim 1, as described above, and further comprising indexing said second table according to said function and a subset of said instruction (Page 288, section 5.2, Figure 6, The PHT is indexed according to a function of a subset of the instruction.).

16.   Referring to claim 13, Wang et al. have taught a multi-mode predictor in a

processor, comprising:

        a.   a first table indexed by an instruction pointer (Page 288, section 5.2,

Figure 6, VHT) and having table entries that includes a mode field (Page 288,

section 5.2, Figure 6, "State" field) and an information field (All fields in the VHT

of Wang et al. contain information and are therefore each considered an

"information field".);

        b. a second table indexed by a function of said instruction pointer and said first

table (Page 288, section 5.2, Figure 6, PHT); and

        c. a hit condition in said second table that correlates to a predicted value of a

prediction mode (Page 288, section 5.2, Figure 6, A hit condition in the PHT

correlates to a predicted value of a prediction mode.).

17.   Claims 14-16 do not recite limitations above the claimed invention set forth in

claims 7-9 and are therefore rejected for the same reasons set forth in the rejection

of claims 7-9 above, respectively.

18.   Claims 17 and 18 do not recite limitations above the claimed invention set

forth in claims 2 and 3 and are therefore rejected for the same reasons set forth in

the rejection of claims 2 and 3 above, respectively.

19.   Referring to claim 19, Wang et al. have taught a processor comprising:

        a.   a multi-mode predictor comprising a first table (Page 288, section 5.2,

Figure 6, VHT) and a second table (Page 288, section 5.2, Figure 6, PHT),

wherein said first table includes a plurality of entry fields (Page 288, section

5.2, Figure 6, VHT, "value history pattern" fields) and said second table

includes a plurality of entry fields (Page 288, section 5.2, Figure 6, PHT), and

having a plurality of prediction modes (Page 288, section 5.2, Figure 6, Pages

284-285, section 3.2, Init, Transient, and Steady modes.);

b. a set of instructions that index said first table to provide a signal (Page 288,

section 5.2, Figure 6, "Prediction Valid" signal); and

c. a set of predicted values for said set of instructions (Page 288, section 5.2,

Figure 6, Predicted values in VHT and PHT), said set of predicted values

stored in said first table (Page 288, section 5.2, Figure 6, VHT) and said

second table (Page 288, section 5.2, Figure 6, PHT).

20.   Referring to claim 20, Wang et al. have taught the processor of claim 19, as

described above, and wherein said multi-mode predictor further comprises a

function that indexes said second table according to said set of instructions and said

first table entry fields (Page 288, section 5.2, Figure 6, The PHT is indexed as a

function of the set of instructions and the value history pattern entries.).

21.   Referring to claim 21, Wang et al. have taught the processor of claim 19, as

described above, and wherein said set of predicted values includes a first set of

predicted values stored in said first table (Page 288, section 5.2, Figure 6, VHT),

and a second set of predicted values stored in said second table (Page 288, section

5.2, Figure 6, PHT).

22.   Referring to claim 22, Wang et al. have taught the processor of claim 21, as

described above, and further comprising a hit condition in said second table that

accesses said second set of predicted values (Page 288, section 5.2, Figure 6, An

entry is selected from the PHT.).

23.   Referring to claim 23, Wang et a1 have taught the processor of claim 21, as

described above, and further comprising a miss condition in said second table that

accesses said first set of predicted values (Page 288, section 5.2, Figure 6, When

the 2-level predictor does not make a prediction, then the first set of predicted values

are selected.).

24.   Referring to claim 24, Wang et al. have taught a multi-mode predictor,

comprising:

    a. a first table, indexed by an instruction pointer (Page 288, section 5.2,

    Figure 6, VHT) and having first table entries (Page 288, section 5.2, Figure 6,

    VHT, "Value history Pattern" entries), each having a mode field (Page 288,

    section 5.2, Figure 6, "State" field) and a first prediction field result (Page

    288, section 5.2, Figure 6, "Data values" field);

    b. a function unit (Page 288, section 5.2, Figure 6, The decoder that selects a

    value from the PHT is the Function Unit.) having an input for instruction

    pointer data (Page 288, section 5.2, Figure 6, The output from the "Value

    history pattern" is the instruction pointer data) and coupled to said first

    prediction result fields of the first table entries (Page 288, section 5.2, Figure

6, The decoder is coupled to the Value history pattern fields.), and having an output for a calculated pointer (Page 288, section 5.2, Figure 6, The decoder outputs a pointer for the PHT.);

c. a second table indexed by the calculated pointer and having second table entries having second prediction result fields (Page 288, section 5.2, Figure 6, The pointer from the decoder selects a prediction result entries from the second table.); and

d. a selector (Page 288, section 5.2, Figure 6, 2: 1 MUX), having a control input coupled to the mode fields (Page 288, section 5.2, Figure 6, The 2: 1 MUX is coupled to the "State", or mode fields.) and data inputs coupled to the first and second prediction result fields (Page 288, section 5.2, Figure 6, the 2: 1 MUX has data inputs coupled to the first and second prediction result fields.).

25.   Referring to claim 25, Wang et al. have taught the predictor of claim 24, as described above, and wherein the first prediction result fields comprise a stride sub-filed (Page 288, section 5.2, Figure 6, "Stride" field) and a last value sub-field (Page 288, section 5.2, Figure 6, "Data Values" field).

26.   Referring to claim 26, Wang et al. have taught the predictor of claim 24, as described above, and wherein the first table generates a signal indicating whether the instruction pointer hit the first table (Page 288, section 5.2, Figure 6, "Prediction Valid" signal).

(10) Response to Argument

1.   Claims 13, 19 and 24 are all independent claims of differing scope than claim 1, but not separately argued by Appellant. Claims 14-18 which depend from claim 13, claims 20-23 which depend from claim 19, and claims 25 and 26 which depend from claim 13, are not separately argued either. Therefore Examiner maintains the rejection of claims 13-26 without added commentary.

2.   According to MPEP 2163 II, claim construction is an essential part of the examination process. Each claim must be separately analyzed and given its broadest reasonable interpretation in light of and consistent with the written description. See, e.g., In re Morris, 127 F.3d 1048, 1053-54, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997). Since the arguments presented by Appellant seem to improperly import limitations from the specification into the claims, Examiner first articulates the construction of claim 1 by providing the broadest reasonable interpretation of each contested claim limitation and explaining how the prior art of Wang et al. has taught each limitation of claim 1 in the section entitled "**CLAIM CONSTRUCTION OF CLAIM 1**". The arguments presented by Appellant in the Appeal Brief are subsequently addressed below in the section entitled "**RESPONSE TO ARGUMENTS PRESENTED BY APPELLANT IN THE APPEAL BRIEF**".

CLAIM CONSTRUCTION OF CLAIM 1

3.   Appellant has essentially argued in pages 7-10 of the Appeal Brief that the following limitations in claim 1 are not taught by Wang et al.

a.   ***"Providing a prediction mode for said instruction;***

b.   ***Determining a hit in a second table,***

c.   ***said second table to provide a prediction value,***

d.   ***said hit in the second table being determined according to a function of said instruction and said first table; and***

e.   ***Predicting the predicted value according to said hit and said prediction mode."***

4.   However, the limitations above are interpreted in the following manner to form the prior art rejection set forth in the original office action mailed on February 11, 2004, and maintained in the final rejection mailed on November 26, 2004:

a.   ***Providing a prediction mode for said instruction***

(INTERPRETATION: A prediction mode is provided for an instruction. This limitation does not specifically state where the prediction mode must come from. Furthermore this limitation does not specifically define where the prediction mode is provided. A prediction mode is generically provided somewhere for an instruction.)

(PRIOR ART: On page 288 and in Figure 6, Wang et al. has taught accessing the VHT using a hashed instruction address and providing a corresponding "state" value of the VHT for the instruction to a 2:1 MUX. The "state" in Wang et al. is the "prediction mode" that is provided, as required by claim 1. Therefore Wang et al. has taught "Providing a prediction mode ("state"), for said instruction (for the instruction corresponding to the instruction address)" as required by claim 1.);

b.   ***determining a hit in a second table***

(INTERPRETATION: This limitation does not limit how the "hit" is specifically

determined.   A "hit" is interpreted as "a successful retrieval of data from a

memory" as this is the known meaning to one of ordinary skill in the art. The

"second table" is interpreted as "data values stored in a memory." Therefore all

that is required of this limitation is to successfully retrieve a data value from a

memory of data values.)

(PRIOR ART: On page 288 and in Figure 6, Wang et al. has taught retrieving a

data value from the PHT. The PHT is a memory of data values. Therefore Wang

et al. has taught "determining a hit in a second table" as claimed since a data

value is successfully retrieved from the PHT, where the PHT is a memory of data

values.),

c.   ***said second table to provide a prediction value***

(INTERPRETATION: The "second table" is interpreted as "data values stored in

a memory". The antecedent basis for "said second table" limits this claimed

instance of the second table to be the same table, or group of data values stored

in the memory, from which the hit is determined   A "prediction value" is

interpreted as a value of or relating to a prediction. This limitation merely

requires that the table from which the hit is determined in must be the same table

that provides a value of or relating to a prediction.)

(PRIOR ART: On page 288 and in Figure 6, Wang et al. has taught the PHT,

which is a memory of data values, or a table, providing a value for a prediction.

The PHT outputs a selected PHT entry. When the entry is greater than a

specified threshold, then the selected PHT entry is the final prediction value, or

the "predicted data value" in Figure 6 of Wang et al. Therefore Wang et al. has

taught said second table to provide a prediction value.*),*

d. ***said hit in the second table being determined according to a function***

of said instruction and said first table

(INTERPRETATION: This claim only requires that the value retrieved from the

second table, which is the hit, is 1: According to a function of the instruction, and

2: According to the first table.)

(PRIOR ART: On page 288 and in Figure 6, Wang et al. has taught that the value

retrieved from the PHT, or second table, is according to a function of the

instruction and the first table since the value used to select and retrieve the value

from the PHT comes directly from the VHT, which is an output of the first table.

The output of the VHT is a function of a hashed instruction address. So the hit of

the PHT is determined according to a value from the first table, wherein the value

from the first table is according to a function of the instruction. Therefore Wang

et al. has taught said hit in the second table being determined according to a

function of said instruction and said first table.); and

e. ***Predicting the predicted value according to said hit and said***

prediction mode

(INTERPRETATION: This claim merely requires that a predicted value be

according to a data value retrieved from a memory and the prediction mode.

Due to the antecedent basis of "prediction mode" this instance of the prediction

mode must also be the same prediction mode that is provided for said instruction

in said providing step.)

(PRIOR ART: On page 288 and in Figure 6, Wang et al. has taught that the

"Predicted Data Value" output in Figure 6 from the 2:1 MUX is according to a

data value retrieved from the PHT memory and the "state", where the "state" is

the prediction mode of claim 1. The "Predicted Data Value" of Wang et. al. in

figure 6 is based on the output of the various multiplexers and the adder. The

output of the various multiplexers and the adder is based on both the value

retrieved from PHT, or the second table, and the "State", or the prediction mode.

Therefore Wang et al. has taught predicting the predicted value according to said

hit and said prediction mode.)

RESPONSE TO ARGUMENTS PRESENTED BY APPELLANT IN THE APPEAL BRIEF

5.   On pages 8 and 9, Appellant argues in essence:

"Applicants respectfully submit that the PHT disclosed in the Wang reference is

not the equivalent of the "second table" as recited in independent claim 1.

Contrary to the Office Action's assertion, Applicant's respectfully submit that the

PHT does not provide a prediction value as is specifically recited in the

embodiment of claim 1, but rather is to determine whether the 2-level predictor is

to generate a predictor value."

Appellant is correct in that the value from the PHT determines whether the 2-

level predictor is to generate a prediction value. When the value from the

selected PHT entry is greater than a specified threshold value, then the 2-level

predictor makes a prediction labeled as "Predicted Data Value" in Figure 6. In

this case the prediction of the 2-level predictor is the value from the PHT, such

that the PHT does in fact provide the prediction value of claim 1. When the 2-

level predictor does not make a prediction, then the value predicted (if any) by

the stride-based predictor is selected as the "Predicted Data Value" in Figure 6.

Figure 6 is a hybrid predictor such that a 2-level predictor and a stride-based

predictor are combined, illustrated in Figure 6, such that either a 2-level predictor

or the stride-based predictor provides the "Predicted Data Value". When the 2-

level predictor provides the prediction, then the "Predicted Data Vale" is from the

PHT. When the stride-based predictor provides the prediction, then the

"Predicted Data Vale" is from the VHT. Thus the PHT does in fact provide a

prediction value as in claim one. Therefore this argument is moot.

6.   On pages 9 and 10, Applicant argues in essence:

> *"Applicants further submit the cited references do not disclose "...determining a
> hit in a second table..." as recited in claim 1. ... The comparison of two numbers
> does not comprise a "hit" as disclosed in Applicants' invention. Support for this
> limitation as used herein can be found at line 24 of page 5 of the specification:
> ... Preferably, valid signal 126 is a "hit" signal that indicates a hit has occurred in
> PIP table 122 ... "*

However, as an initial matter, the term "preferably" used in the specification

regarding the "hit" is a clear indication that the specification is not meant to limit

the term "hit" in the claims since "preferably" is an exemplary term. Furthermore,

"the comparison" of Wang is not interpreted as "the hit" in claim 1. The claim

specifically states "determining a hit in a second table". This limitation does not

limit how the "hit" is specifically determined. A "hit" is interpreted as a successful

retrieval of data from a memory as this is the known meaning to one of ordinary

skill in the art at the time of the invention. The "second table" is interpreted as

data values stored in a memory. Therefore all that is required of this limitation is

to successfully retrieve a data value from a memory of data values. On page 288

and in Figure 6, Wang et al. has taught retrieving a data value from the PHT.

The PHT is a memory of data values. Therefore Wang et al. has taught

"determining a hit in a second table" as claimed since a data value is successfully

retrieved from the PHT, where the PHT is a memory of data values. Therefore

this argument is moot.

7.   On page 10, Applicant argues in essence:

*"According to an embodiment of the present invention, a match result of a
prediction value within the second table results in a "hit". It is clear the
comparator PHT in Wang is incapable of providing such a "hit" as defined by the
present invention."*

However, it appears that applicant is not even arguing a specific claim. This

argument appears to be with respect to an embodiment in the specification and

not with respect to a specific claim, which is improper. It is noted that the

features upon which applicant relies (i.e., a match result of a prediction value

within the second table results in a "hit") are not recited in the rejected claim(s).

Although the claims are interpreted in light of the specification, limitations from

the specification are not read into the claims. See *In re Van Geuns*, 988

F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). It appears that Applicant is

attempting to relate the prediction value in claim 1 to the hit in the claim. In the

claim as worded there is absolutely no connection between the prediction value

and the hit. Claim 1 states, "determining a hit in a second table", this limitation does not associate the prediction value and the hit together. The claim 1 further states, "said second table to provide a prediction value", this limitation does not associate the prediction value and the hit together either. Claim 1 still further states "said hit in the second table being determined according to a function of said instruction and said first table", this limitation still fails to draw a connection between the prediction value and the hit together in the claim.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Tonia L. Meonske

September 25, 2006
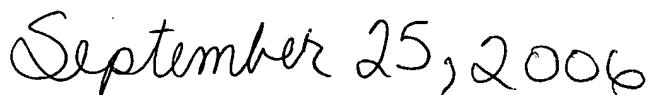
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Fritz M. Fleming
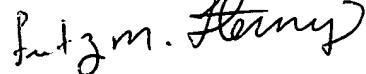
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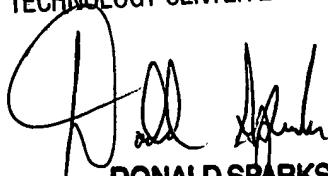
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